The LED revolution

LED OT-light systems for surgery

Mach LED 5\textsuperscript{MC} and LED 5\textsuperscript{SC}
Mach LED 3\textsuperscript{MC} and LED 3\textsuperscript{SC}
Mach video transmission system with SD camera
Mach video transmission system with HD camera
New highlights in the OT

Dr. Mach sets standards in the medical illumination technology for decades.

The new OT-light generation with LED technology supports your professionalism by innovative technology and design.

The advantages of the LED technology: adjustable light color (MC models only), a life-span of minimum 40,000 hours and an almost nonexistent heat development in the surgeon’s head area and in the wound field.

The advantages already provided by Dr. Mach’s light technology with halogen and gas discharge lamps have been maintained: natural color reproduction, exact illumination of the wound field and easy positioning of the light head.

Your Team

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**Dr. Mach LED technology**

Dr. Mach provides two different LED technologies for its OT-lights:

1. **MC models**

are equipped with **Multi-Colour-chips**. The use of different-coloured LED-chips allows the surgeon to change the colour temperature of the OT-light depending on the preference for a more cold-white light (colour temperatures ≥ 4500 K) or for a warm-white OT-light (colour temperatures ≤ 4250 K). The surgeon can set the colour temperature according to the tissue structure, the surgical application and individual colour sensitivity. This way we avoid tiredness during work. For instance, dazzling effects can be avoided after longer interventions by using a warmer light. On the other hand it is possible to increase the contrast by using higher colour temperatures, which supports the surgeon's power of concentration.

2. **SC models**

are equipped with **Single-Colour-chips**. Changing the colour temperature is not possible in this case. Of course all the other advantages of the LED technology are also implemented here, or they can be ordered for surcharge (integrated laser pointer).

**Lighting technology - special features of the MC models**

**Colour composition inside the light head**

Dr. Mach already merges the different coloured LED's by a computer-calculated optical system with light guide and facetted lenses.

This means: The composed light leaves the optical system as white light and is dispersed over the wound field homogeneously.

Colour shadows in the light beam of the OR light caused by the surgeon’s head, shoulder or hands are avoided by the colour composition in the optical system.

**Changing the light colour**

The use of different coloured LED’s makes it possible for the first time in surgery to change the light colours depending on the application. The surgeon has the possibility to choose the optimum OR light according to the tissue type and the wound field texture.

Five different colour temperature values can be set: 3750, 4000, 4250, 4500 and 4750 Kelvin. The setting can be done either at the key pad on the lamp housing or by a right-turn of the ring at the sterilisable handle.

*The LED-OT-lights can be equipped optionally with different colour temperature ranges, e.g. from 3500 K to 5000 K.*

**Superior colour rendition**

With colour rendering indexes Ra above 96 and R9 (red) above 90 the surgeon recognizes clearly the tiniest nuances of colour in tissue. The colour rendering index for SC models is Ra = 95. For recognizing the exact colour spectrum of the wound the exact rendition of the red colour range is essential. R9 (red) ≥ 90 means for the surgeon a visibly better recognition of details. The colour spectrum of the wound is rendered naturally with rich contrast. The OT-light clearly provides welcome relief for your eyes.

**Illumination in depth**

You have the possibility to increase the light intensity of the central segment of the OR-light. This enables an optimum illumination of the wound field according to its texture and the shadowing effects.

A high and adequate light intensity is very important especially in cases of narrow and deep wound channels.

**Facetted multi-lens system**

A multitude of computer-calculated facetted lenses guarantees homogeneity and lowest shadiness in the light field.

Separately arranged optical systems, each with four LED modules (Multi-Colour models) or each with one LED module (Single-Colour models), generate their own light field, which increases the contrast effect of the OR light. Light intensities of 160.000 Lux can be attained without difficulty.

**Common characteristics of the MC models and SC models**

**R9-values**

between 20 and 70

**Ra-values**

between 50 and 95

**Dr. Mach light system (MC models)**

**Conventional lighting systems**

**Dr. Mach light system (SC models)**

**Ra ≥ 96**

**R9 ≥ 90**
Dr. Mach LED technology

Integrated OT-laser pointer (optional)
The built-in laser pointer always indicates the middle of the light field and helps the surgeon to find the optimal position of the OT-light to the wound field.

The laser pointer can be activated either at the key pad on the lamp housing or by a left-turn of the ring at the sterilisable handle.

After a short time the laser pointer turns off automatically.

Key pad on the lamp housing
Several light functions can be adjusted electronically, such as:
- Switching ON and OFF
- Illumination in depth
- Laser pointer
- Electronic light intensity control
- Endo-Light
- Changing the colour temperature: 3750, 4000, 4250, 4500, 4750 K

Flow properties
During development high attention was paid to the performance of the new LED OR lights in laminar-flow ceiling systems. The flow-enhancing ring form of all light heads (open ring form for the Mach LED 5 models) and the minimal surface avoid any heat increase in the surgeon’s head area and create a perfect laminar flow performance, being a basic hygienic requirement in surgery.

Hygiene
The disk sealings of the light outlets and the circumferential sealing cord avoid infiltrations of dust, dirt and liquids inside the lamp head.

Wall panel
The OT-light can be operated at the wall panel (optional equipment against surcharge). Setting of the light functions is done synchronal at the wall panel and the light head.

Several light functions can be adjusted electronically, such as:
- Switching ON and OFF
- Illumination in depth
- Laser pointer
- Electronic light intensity control
- Endo-Light
- Changing the colour temperature (MC models only)

Handle
Merging of light fields is done by turning the sterilisable handle. The ring at the top of the handle allows the surgeon to set the most important light functions in the sterile area.

The light functions mentioned below can be set at the ring of sterilisable handle:
- Laser pointer (by a left-turn of the ring on the top of the handle)
- Changing the colour temperature (MC models only) or illumination in depth (by a right-turn on the top of the handle)

Cool light
The LED technology is much more effective than conventional light sources such as halogen bulbs. The heat radiation is reduced to a minimum without using any expensive filter technique. The temperature increase in the surgeon’s head area is almost nonexistent.

Long life-span/low power consumption
The life-span of more than 40,000 operating hours reduces the costs for exchanging and replacing the illuminants considerably, compared with the conventional halogen technology used with former OT-lights. By implementation of the LED technology the power consumption could be reduced partially with more than 50%.
OT-lights combination:
Mach LED 5 and Mach LED 3 with integrated video system and monitor

Mach LED 5
160.000 Lux

Mach LED 3 with camera
130.000 Lux
OT-lights combination:
Mach LED 5 with camera/Mach LED 3

130,000 Lux

OT-lights combination:
Mach LED 5/Mach LED 5

160,000 Lux

OT-lights combination:
Mach LED 5 with camera

160,000 Lux

OT-lights combination:
Mach LED 3

130,000 Lux

OT-lights combination:
Mach LED 5

160,000 Lux

OT-lights combination:
Mach LED 5

160,000 Lux
Mach LED 3
130.000 Lux

Mach LED 3 with camera
130.000 Lux

OT-lights combinations
for low room heights

Mach LED 5
160.000 Lux

Mach LED 3/Mach LED 3 with camera
OT-lights combination with special ceiling arms for low room heights below 2,80 m

Mach LED 3/Mach LED 3 with integrated video system and monitor
OT-lights combination with fully cardanic suspension for room heights above 2,80 m

Mach LED 3/VarioView
OT-lights combination with special ceiling arms for low room heights below 2,80 m
### Mach LED 3 mobile lights (optionally with integrated video system)

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Mach LED Ssc</th>
<th>Mach LED Sc 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light intensity (Lux at 1 m)</td>
<td>108,000</td>
<td>130,000</td>
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<tr>
<td>Life span of the LED’s &gt; 40,000 h</td>
<td>40,000 h</td>
<td>40,000 h</td>
</tr>
<tr>
<td>Number of LED’s</td>
<td>160</td>
<td>112</td>
</tr>
<tr>
<td>Total power consumption</td>
<td>160 W</td>
<td>120 W</td>
</tr>
<tr>
<td>Height adjustment (in cm)</td>
<td>118</td>
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</tr>
<tr>
<td>Working distance (in cm)</td>
<td>60-150</td>
<td>60-150</td>
</tr>
<tr>
<td>Diameter of the lamp head (in cm)</td>
<td>72</td>
<td>57</td>
</tr>
<tr>
<td>Dimming range</td>
<td>5 - 100 %</td>
<td>5 - 100 %</td>
</tr>
<tr>
<td>Electronic light intensity control at the lamp head</td>
<td>standard</td>
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<tr>
<td>Temperature increase in head area</td>
<td>5 - 100 %</td>
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<tr>
<td>Colour temperature (Kelvin)</td>
<td>4500</td>
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<tr>
<td>Illumination depth</td>
<td>1500 mm</td>
<td>1200 mm</td>
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<tr>
<td>Focussable size of the light field (in cm)</td>
<td>20 - 32</td>
<td>17 - 28</td>
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<td>Colour rendering index Ra</td>
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* Optionally available with 740,000 Lux
* Optionally available with different colour temperature ranges
* Manufacturer: National Display Systems
**Integrated video system**

SD camera

A Sony camera with 36-fold optical zoom, auto-focus, auto-iris and image rotation is used. Via remote control panel it can be controlled at the same time from an auditorium or other rooms.

**Camera remote control**
- 36-fold optical zoom
- focus-control (automatic/manual)
- iris-control (automatic/manual)
- color-control
- frozen image
- optional with image rotation

**Digital video system**

By a new digital camera remote control you can now receive digital video signals for the computer or network. Analog camera images are converted in MPEG4-video signals. These are available through a RJ45 interface at the remote control and a network cable.

**Advantages:**
You don’t need a video card any longer. The images can be directly saved on the computer if sufficient capacity is available. Nevertheless you can further record the signals on video or DVD-recorders. For this the remote control panel is equipped with two S-video (Y/C) connectors.

**Available digital video systems (option against surcharge)**

**Video system DIGITAL ECO**
Every computer in the network has access to the video images and they can be saved on a hard disc drive of sufficient capacity.

**Video system DIGITAL PC-CONTROL**
As with this video system Digital Eco every computer in the network has access to the video images and they can be saved on a hard disc drive of sufficient capacity. Additionally the camera can be controlled by a specially designed software through the PC-screen. This is done by an IP-address designated for the camera remote control.

**Technical data**

**Dr. Mach camera MFB-MO**

- Objectives system: 36-fold optical zoom, 12-fold digital zoom
- Video output: 75 Ohm VBS: 1.0 Vp-p., Sync. Negative, Y/C Output
- Image points: 752 (H) x 582 (V)
- Horizontal resolution: Over 530 lines
- Humidity: 20 - 85%
- Dimensions (Ø, length): 80 x 150 mm
- Weight: 900 g
- Interference radiation in acc. with FCC class A

**Technical data**

**Dr. Mach HD camera**

- Objectives system: 10-fold optical zoom, 12-fold digital zoom
- Video output: HD: 1080i/59.94, 1080i/50, 720p/59.94, 720p/50
- Image points: approx. 2,000,000 pixels
- Humidity: 20 - 80%
- Dimensions (Ø, length): 80 x 150 mm
- Weight: 968 g
- Interference radiation in acc. with FCC class A

**Transmission:**
The HD-SDI signal is transmitted through sliding contacts. This enables a 360° continuous rotation in all major joints of the OT-light with integrated HD camera.

**Dr. Mach**

Dr. Mach has developed an innovative video transmission system with a high-definition camera with digital data transmission for visual communication.

**HD resolution**
With the transmission of high-resolution pictures of the surgeries and the medical interventions we fulfil your visual requirements.

**Advantages:**
A brilliant picture quality with high depth of field and increased detail reproduction means a better recognition of the details in the woundfield by the surgeon or the physician.

**Camera technology**
The HD camera is equipped with 10-fold optical zoom, auto-focus, auto-iris and picture rotation. The camera is operated with a control unit.

**Several camera functions can be adjusted on the control unit, such as:**
- Switching ON and OFF
- Switching between HD-mode (1080i) and SD-mode (720p)
- Focus (automatic/manual)
- Iris (automatic/manual)
- Zoom
- Picture rotation
- Frozen image

For detailed informations please ask for our special catalogue for single lights.